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# STORMWATER MANAGEMENT

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## Site Plan Review

## City of Saint Paul

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A stormwater management plan must be submitted as part of the site plan package. The purpose of the plan is to show how stormwater will be handled on the site: where it will drain to, at what rate, and steps that will be taken to protect water quality.

### SITES SMALLER THAN ONE QUARTER ACRE

For small sites it is usually possible to meet the requirements for stormwater management simply by grading the site so that stormwater flows to a street or a public alley. Stormwater drainage must be shown on the plan by grades and/or drainage arrows. Stormwater may not drain across a public sidewalk at any point except at a driveway.

### SITES LARGER THAN ONE QUARTER ACRE

For sites where more than one quarter of an acre is affected by development, the City requires that the rate of storm water runoff for the site may not exceed 1.64 cubic feet per second per acre. Stormwater must normally be directed to on-site stormwater detention ponds and catch basins connected to the City storm sewer system in order to control the rate of stormwater runoff from the site. The following information must be submitted:

#### Grading

- Grades or contours to define the route of stormwater and stormwater detention areas.

#### Drainage areas

- Outline of each separate drainage area within the site property lines or improvement limits. Include roofs and all other surface areas.
- Area in square feet of each drainage area.
- Area in square feet of area of pervious and impervious surfaces for each drainage area .

#### Detention Areas

- Outline of each separate detention area. Ponding may be provided in parking lots, green areas, roof tops or underground storage.
- Depth of detention areas.
- Area in square feet of detention areas
- Area of contour intervals from bottom to top of detention areas.
- Detention area overflow route

#### Structures

- Location and details of all structures used to control the rate of discharge of stormwater from the site. These include catch basins, manholes, pipes, weirs, curb openings and control flow roof drains. Rim and invert elevations must be provided.

#### Connections to public sewers

- Storm connections are not permitted to public catch basins or sanitary sewers
- The plan must include a note stating "Connections to public sewers must be done by a Licensed House Drain Contractor under a permit from Saint Paul Department of Public Works."

#### Calculations

- Calculate allowable discharge rate and required detention for the critical 100 year rainstorm event.
- Calculations must be shown on the worksheet provided inside this handout.
- The city uses HydroCAD to check for conformance with stormwater management requirements

Please contact Anca Sima of Saint Paul Public Works at 651-266-6237 (phone) or [anca.sima@ci.stpaul.mn.us](mailto:anca.sima@ci.stpaul.mn.us) (email) if you have questions about these City requirements.

### SITES LARGER THAN ONE ACRE

In addition to meeting the City's standards for rate control listed above, projects that disturb more than one acre must obtain a permit from the MPCA and the local watershed district. They review plans for how they will affect water quality. A Stormwater Pollution Prevention Plan must be submitted that shows measures that will be taken during construction (such as silt fences) and long term (such as stormwater ponds).

#### (Minnesota Pollution Control Agency) MPCA

A General Storm Water Permit – Construction Activity is issued by the MPCA. Information is available at 651-296-7219 or <http://www.pca.state.mn.us/water/stormwater/stormwater-c.html> .

#### Watersheds

Most of Saint Paul, except for the West Side, is located in a Watershed District that requires a permit for projects larger than one acre. They review how projects will affect stormwater quality during construction (silt fences, inlet protection, street sweeping etc.) and after (rate control and volume control for stormwater etc).

- Ramsey Washington Watershed (<http://www.rwmwd.org/> or 651-792-7950) covers the east third of Saint Paul.
- Capitol Region Watershed (<http://www.capitolregionwd.org/> or 651-644-8888) covers the west two thirds of Saint Paul.

The boundaries of the Watershed Districts can be found on their web sites.

Information about stormwater management and other site plan review is also available on-line at [www.stpaul.gov/dsi](http://www.stpaul.gov/dsi). Click on Zoning and then click on Site Plan Review.

## **REQUIRED PLANS AND INFORMATION**

### **Stormwater management plans and calculations**

The plans and calculations listed on the first page of this handout must be submitted as part of the submittal for site plan review.

### **PDF or AutoCad files**

Once the site plan is approved, the applicant must email the approved drawings of the site plan in PDF and AutoCad along with any custom line type files and external references to: [anca.sima@ci.stpaul.mn.us](mailto:anca.sima@ci.stpaul.mn.us).

### **Construction Record Drawings**

As a condition of the approved site plan, the applicant must provide as-built drawings (paper or PDF) of all sanitary and storm sewer lines and all appurtenances which were installed on a site for which a final site plan was approved. The drawings shall be submitted to Saint Paul Public Works no later than 60 days following installation of the sewer facilities. As-built changes to text including: invert elevations, dimensions, notes, etc. shall be lined out with the record drawing text placed near it. Do not alter, modify or erase original approved construction drawing text. The construction as-built drawings shall show, but are not limited to, such information as the exact size, length, type and location of pipes; location and size of manholes and catch basins; depth and slopes of retention basins. The drawings shall show plan and profile views of all new public sanitary and storm sewer lines and plan views of all private sewer lines. The construction as-built drawings shall show all work as actually installed and as field verified by a professional engineer or a representative thereof. The drawings shall be identified as "Construction As-built Drawings" in the title block of each drawing and shall bear the signature and seal of a professional engineer.

Construction Record Drawings should be submitted to

Anca Sima  
Public Works Sewers Division  
700 City Hall Annex  
25 West 4<sup>th</sup> Street  
Saint Paul, MN 55102

[anca.sima@ci.stpaul.mn.us](mailto:anca.sima@ci.stpaul.mn.us)

# STORMWATER MANAGEMENT WORKSHEET

## 1. DATA FOR EACH DRAINAGE AREA

Use the table below to define each drainage area on the site.

DRAINAGE AREA NAME	AREA (SQ. FT.)	IMPERVIOUS AREA (SQ. FT.)	PER CENT IMPERVIOUS	AVERAGE SLOPE OF PREVIOUS AREAS
TOTAL				

## 2. ON-SITE DETENTION

The following table includes a summary of total rainfall depth for various duration 100 year storms in Saint Paul. Use the table to calculate the amount of on-site detention required. The maximum storage value is the required amount of on-site detention. The maximum storage value usually occurs at the 15 or 30 minute time.

TIME (MINUTES)	RAINFALL (INCHES)	RUNOFF (CU. FT.)	TO SEWER (CU. FT.)	STORAGE (CU. FT.)
5	0.84			
10	1.38			
15	1.76			
30	2.44			
60	3.15			
120	3.50			

**Time:** From "100 year storm" data\*

**Rainfall:** From "100 Year Storm" data\*

**Runoff=**  $\frac{\text{Rainfall} \times C \times \text{Area in Square feet}}{12}$

(1 ACRE = 43,560 SQ. FT.)

**To Sewer:** Time x 60 x 1.64 x Area in Acres

**Storage=** Runoff - To Sewer

**Allowable Q** = 1.64 c.f.s / Acre

**C =**  $\frac{(.95 \times \text{Impervious Area}) + (.25 \times \text{Pervious})}{\text{Total Area}}$

Note: The term "100 Year Storm" as used in this table refers to a storm of a given duration and rainfall depth which has a one percent probability of occurring during any given year in a particular location. The information is taken from "Five to 60 Minute Precipitation Frequency for the Eastern and Central United States" and "Technical Paper No. 40: Rainfall Frequency Atlas of the United States". Both of these publications are prepared by the National Weather Service.

(Worksheet is continued on the next page.)

### 3. DETENTION DATA

Define detention areas within property lines and outline maximum pond contour elevation. Give calculations for detention volumes. For irregular shaped detention areas with defined contours between bottom and top elevations, the following formula may be used:

$$V = (h/3) (A_1 + A_2 + \sqrt{A_1 \times A_2})$$

Where:

h = difference in elevation between contours in feet

A<sub>1</sub> & A<sub>2</sub> = areas of contours in square feet

Note: The volume between the bottom elevation and the next highest contour should be V=(hA)/3

ELEVATION	h	AREA (SQ. FT.)	VOLUME (CU. FT.)
BOTTOM		0	-
CONTOUR			
CONTOUR			
CONTOUR			
TOP			

### 4. PIPE SIZE AND ELEVATION

Detention area discharge rates must be given for each detention area. The formula for calculation must be given along with any constant values used in the formula. Discharge controls may include only permanent unalterable fixtures such as sized pipes, curb weirs and control flow roof drains. Orifice plates and grate controls are not allowed.

Most flow control should be by pipe size. Minimum pipe size required is 4" diameter. Pipe flow rates may be approximated by use of the following orifice equation;

$$Q = CA\sqrt{2gh}$$

Where:

Q = discharge in cubic feet per second

C = 0.65

A = Area of orifice in square feet

2g = 64.4

h = height of water above center of orifice in feet

The standard flow rate will be determined by the city's computer program which considers other factors, including head, entrance loss, pipe loss and exit loss.

The following data must be provided for all pipe controlled discharges:

PIPE LENGTH	DIAMETER IN INCHES	PIPE TYPE	UPSTREAM WATER ELEVATION	UPSTREAM INVERT ELEVATION	DOWNSTREAM WATER ELEVATION	DOWNSTREAM INVERT ELEVATION

Note: For off site discharge to city storm sewer, the following assumption can be made:  
Downstream water elevation = Downstream invert elevation